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EXAMINER	
RAO, SHRINIVAS H	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 10/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/864,714	PARANJPE ET AL.	
	Examiner	Art Unit	
	Steven H. Rao	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,8-26 and 33-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-6,8-26 & 33-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

Applicants' amendment filed on July 23, 2004 has been entered on August 03, 2004.

Therefore claims 1, 3,17 and 33 as currently amended and presently newly added claims 34 to37 and claims 2,4-16 and 18-26as previously recited are currently pending in the Application.

Non-elected claims 7 and 27-32 were previously cancelled.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 –6, 8-16 and 17- 26 and 33-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claims 1 and 17 recite " wherein the film, as deposited, generally has a tensile intrinsic stress ".

It is not clear what applicants' intend to include/exclude by the recitation " generally has ".

Therefore the entire phrase " wherein the film, as deposited, generally has a tensile intrinsic stress " is not clear as to when the deposited layer has to have the tensile intrinsic stress or not and to what extent it need to have the stress if applicable to qualify the recitation " generally has" .

Further dependent claims 2-6, 8-16 and 18-26 and 33-37 are rejected at least for depending from a rejected claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 10-12 are rejected under 35 U.S.C. 103(a) as being anticipated by Kim (U.S. Patent No. 6,335,240, herein after Kim previously applied and in view of Solberg et al. (U.S. Patent No. 5,930,046, herein after Solberg) .

With respect to claim1, to the extent understood, Kim describes a method of fabricating a conformal film on a substrate, the method comprising the steps of : depositing a film of predetermined thickness on the substrate by performing a predetermined number of atomic layer deposition cycles in a processing chamber, (Kim fig. 1 # 400, col. 4 lines 25-29) each atomic layer deposition cycle comprising : dosing the substrate with a precursor to establish a mono layer of the precursor on the

substrate (Kim in col. 5 lines 54- -56 and col. 3 lines 13-16, as also previously stated under rejection of claims 7 and 8 below) describes the identical process using the same starting materials including the precursor- trimathylaluminum and water vapor using the same ALD process to form the same layer , therefore what is true for applicants' namely forming a mono layer of precursor on the substrate is also true for the Kim reference) dosing the substrate with a reactant to deposit an atomic layer deposition film (Kim col. 4 lines 30-34) , wherein the film as deposited generally has a tensile intrinsic stress (intrinsic stress is an inherent property possessed by the material and as recited by the applicants' the tensile stress is inherent (belonging by nature or habit) of the material described by the specification and claim 17 the AlOx and the AlOx described by Kim col. Col. 4 lines 32-35 are identical possessing identical inherent tensile stress) and annealing the substrate in a reactive ambient at one or more predetermined thickness to change the intrinsic stress in the film from tensile to compressive after a predetermined number of atomic layer deposition cycles. (Kim col. 6 lines 38-40) to change the intrinsic stress in the film from tensile to compressive .

The presently newly added limitation " to change the intrinsic stress from tensile to compressive " is not specifically mentioned by Kim .

However Solberg , a patent from the same field of endeavor , describes in col.

13 lines 10 to 20, etc. describes " to change the intrinsic stress of the deposited film to provide a method for preparing low net stress enviormentally stable multiplayer thin oxide film coatings which demonstrate excellent optical performance, vidually no moisture adsorption and low optical scatter and also to provide a method which is cost

effective simple and reliable and which utilizes conventional coating , deposition techniques and equipment .

Therefore it would have been to one of ordinary skill in the ad at the time of the invention to include Solberg's step of changing intrinsic stress of the deposited film in Kim's method . the motivation to make the suggested combination is to provide a method for preparing low net stress enviormentally stable multiplayer thin oxide film coatings which demonstrate excellent optical performance, vidually no moisture adsorption and low optical scatter and also to provide a method which is cost effective simple and reliable and which utilizes conventional coating , deposition techniques and equipment . (Solberg col. 4 lines 25-30 and 40-45).

With respect to claim 10, to the extent understood, Kim describes wherein the atomic layer deposition cycle deposits a film having a thickness of approximately 0.8 A0 . (Kim col. 5 line 49).

With respect to claim 11, to the extent understood, Kim describes wherein the precursor comprises a trimethyl aluminum, the reactant comprises water and annealing further comprises annealing in a reactive ambient comprising oxygen. (Kim col. 5 line 54, col. 5 lines 55-56 and Kim col. 3 lines 13-16).

With respect to claim 12, to the extent understood, Kim describes wherein the annealing comprises a rapid thermal anneal. (Kim col. 5 lines 19-20).

B. Claims 2-9 and 13-14,16-26 and 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (U.S. Patent No. 6,335,240, herein after Kim) in

view of Solberg et al. (U.S. Patent No. 5,930,046, herein after Solberg) as applied to calim1 above and further in view of Seutter et al. (U.S. Patent Publication No. 2002/0106846 herein after Seutter).

With respect to claim 2, to the extent understood, Kim describes wherein annealing further comprises plasma annealing the substrate.

Kim describes annealing the substrate without specifying the particular annealing method used.

Seutter, a patent from the same filed of endeavor, describes in paragraph 0058 page 5 lines 6 to 16 plasma annealing method to reduce the nitrogen content in the neighboring layers which in turn reduces the resistivity of the device, for densifying the dielectric layer and thus making a better device.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use Seutter's annealing by plasma treatment instead of Kim's unspecified annealing in Kim's method to reduce the nitrogen content in the neighboring layers which in turn reduces the resistivity of the device, densifying the dielectric layer and thus making a better device. (Seutter para 58, page 5).

With respect to claim 3, to the extent understood, Kim describes wherein annealing the substrate further comprises performing plural plasma anneals, wherein the frequency of the anneals controls the intrinsic film stress from tensile to compressive. (Kim col. 4 lines 32-35).

With respect to claim 4, to the extent understood, Kim describes wherein annealing the substrate further comprises performing plural plasma anneals, wherein

varying the frequency of the annealing controls the intrinsic tensile and compressive film stress (Kim col. 4 lines 19-24).

With respect to claim 5, to the extent understood, Kim describes wherein the annealing further comprises plasma annealing in a reactive ambient. (Seutter para 58 lines 4-5).

With respect to claim 6, to the extent understood, Kim describes wherein annealing further comprises plasma annealing the substrate in a reactive ambient every 25 to 50 A0 of the film deposited . (Seutter para 60, page 5).

With respect to claim 7, to the extent understood, Kim describes further comprising heating the substrate to a temperature sufficiently low so that the mono layer of precursor adsorbed on the substrate is not thermally dissociated. (Seutter para 61 last 4 lines).

With respect to claim 8, to the extent understood, Kim describes wherein the precursor comprises tri methyl aluminum and the substrate is heated to a temperature within the range of between 60 degrees Celsius and 350 degrees Celsius. (Kim col. 5 lines 54-64).

With respect to claim 9, to the extent understood, Kim describes wherein substrate temperature is approximately 150 to 200 degrees Celsius. (Kim col. 5 lines 59-60).

With respect to claim 13, to the extent understood, Kim describes wherein the annealing comprises an in-situ plasma anneal. (Seutter para 0061 plasma within chamber i.e. in-situ).

With respect to claim 14, to the extent understood, Kim describes wherein the plasma anneal comprises heating the substrate with an RF source in an Ar/O2 ambient.(Seutter para 0058 page 5- Ar ambient, RF –source well known in the art).

With respect to claim 16, to the extent understood, Kim describes wherein the dosing the substrate with a precursor further comprises flowing the precursor from a first zone of a multi-zone shower head and dosing the substrate with a reactant further comprises flowing the reactant from a second zone of a multi-zone showerhead. (Seutter paras 24 and 25).

With respect to claim 17, to the extent understood, Kim describes a method for fabricating a thin ALOx film on a substrate with a precursor and atomic layer deposition, the method comprising : heating the substrate to a temperature so that precursor adsorbed on the substrate is not thermally dissociated (Seutter para 61 last 4 lines) and performing plural atomic layer deposition cycles, each cycle comprising deposition of ALOx by reacting a mono layer of precursor on the substrate with a reactant (Kim col. 4 lines 32-35) ; and annealing the ALOx film in a reactive ambient at one or more predetermined film thickness. (Seutter para 60, page 5).

With respect to claim 18, to the extent understood, Kim describes wherein the precursor comprises trimethyl aluminum.(Kim col. 5 lines 54-64).

With respect to claim 19, to the extent understood, Kim describes wherein the substrate temperature comprises approximatley 200 degree Celsius or less. (Kim col. 5 lines 54-64).

With respect to claim 20, to the extent understood, Kim describes wherein the reactant comprises water.(Kim col. 5 lines 55-56).

With respect to claim 21, to the extent understood, Kim describes wherein the precursor flows from a first zone of a multi zone showerhead and the reactants flows a second zone of the multi-zone showerhead. (Seutter paras 24 and 25).

With respect to claim 22, to the extent understood, Kim describes wherein annealing further comprises annealing the ALOx approximately every 25 to 50 A0 of thickness. (Seutter para 60, page 5)

With respect to claim 23, to the extent understood, Kim describes wherein annealing comprises in-situ annealing in a reactive ambient. (Seutter para 0061 plasma within chamber i.e. in-situ).

With respect to claim 24, to the extent understood, Kim describes wherein the reactive ambient comprises Ar/oxygen that oxidizes impurities associated with the ALOx film. .(Seutter para 0058 page 5- Ar).

With respect to claim 25, to the extent understood, Kim describes wherein the film comprises a gap layer for a thin film head.(Kim figs. 3,4).

With respect to claim 26, to the extent understood, Kim describes wherein the film comprises a tunnel barrier in a magnetic tunnel junction. (Seutter para 0005).

With respect to claim 33, Kim describes the method of Claim 17 further comprising: varying the frequency of the annealing to varv the intrinsic stress of the film between tensile and compressive. (Kim col. 4 lines 32-35 and Solberg col. 13 lines 10-20)

With respect to claims 34-37 , to the extent understood, Kim describes the method of Claim 1 wherein annealing the substrate and the film comprises one or more anneals that provide the deposited film with a breakdown voltage of at least 9 Mv/cm (or at least 10 Mv/cm). (Solberg example 1 , etc.)

B. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim (U.S. Patent No. 6,335,240, herein after Kim) in view of Solberg et al. (U.S. Patent No. 5,930,046, herein after Solberg) and Sutter et al. (U.S. Patent Publication No. 2002/0106846 herein after Seutter) as applied to the claims above and further in view of Yamada et al. (U.S. Patent no. 5,616,177 herein after Yamada).

With respect to claim 15, to the extent understood, Kim describes further comprising maintaining a 50/500 dose to adsorption ratio.

Kim Solberg and Seutter describe a film, but do not describe a 50/500 dose to adsorption ratio.

However, Yamada a patent from the same filed of endeavor, describes in col.5 lines 29-37 dose to concentration (adsorption) ratio of between 2:1 to 8:1 to produce a semiconductor having excellent characteristics, a low threshold voltage and a low operating voltage.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Yamada's dose to adsorption ratio in Kim and Suetter's method to produce a semiconductor having excellent characteristics, a low threshold voltage and a low operating voltage. (Yamada col. 2 lines 28-40).

Further it would have been obvious to one of ordinary skill in the art at the time of the invention to use a 50/500 i.e. 1:10/ 10 :1 ratio without a showing of criticality or unexpected results because it was previously done by Yamada between 2:1 to 8:1.

Response to Arguments

Applicant's arguments filed 5/07/03 have been fully considered but they are not persuasive for the following reasons :

Applicants' contention that the applied references do not teach/suggest the tensile stress is not persuasive because the portion of Kim cited by the Applicants' in fact supports the formation of the claimed intrinsic tensile stress and therefore does not teach away as Applicants' conclude .

Dependent claims 2-9 and 13-16 and 18-26,33-37 were alleged to be allowable because of the dependency upon allegedly allowable claims 1 and 17, however as shown above claims 1 and 17 are not allowable and therefore dependent claims 18-26 are also not allowable.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Steven H. Rao whose telephone number is (703) 306-5584. The examiner can normally be reached on Monday- Friday from approximately 7:00 a.m. to 5:00 p.m.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0956. The Group facsimile number is (703) 308-7724.

Steven H. Rao
Patent Examiner
October 12, 2004.

DOUGLAS WILLE
PRIMARY EXAMINER